Fine_Denseiganet: Automatic Medical Image Classification in Chest CT Scan Using Hybrid Deep Learning Framework

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Abstract

Medical image classification is one of the most significant tasks in computer-aided diagnosis. In the era of modern healthcare, the progress of digitalized medical images has led to a crucial role in analyzing medical image analysis. Recently, accurate disease recognition from medical Computed Tomography (CT) images remains a challenging scenario which is important in rendering effective treatment to patients. The infectious COVID-19 disease is highly contagious and leads to a rapid increase in infected individuals. Some drawbacks noticed with RT-PCR kits are high false negative rate (FNR) and a shortage in the number of test kits. Hence, a Chest CT scan is introduced instead of RT-PCR which plays an important role in diagnosing and screening COVID-19 infections. However, manual examination of CT scans performed by radiologists can be time-consuming, and a manual review of each individual CT image may not be feasible in emergencies. Therefore, there is a need to perform automated COVID-19 detection with the advances in AI-based models. This work presents effective and automatic Deep Learning (DL)-based COVID-19 detection using Chest CT images. Initially, the data is gathered and pre-processed through Spatial Weighted Bilateral Filter (SWBF) to eradicate unwanted distortions. The extraction of deep features is processed using Fine_Dense Convolutional Network (Fine_DenseNet). For classification, the Softmax layer of Fine_DenseNet is replaced using Improved Generative Adversarial Network_Artificial Hummingbird (IGAN_AHb) model in order to train the data on the labeled and unlabeled dataset. The loss in the network model is optimized using Artificial Hummingbird (AHb) optimization algorithm. Here, the proposed DL model (Fine_DenseIGANet) is used to perform automated multi-class classification of COVID-19 using CT scan images and attained a superior classification accuracy of 95.73% over other DL models.